7. PROJECT REFERENCE SOUTHALL TO HAREFIELD GAS PIPELINE, UK

7.1 Project Details

History & brief description:
The Harefield to Southall Gas Pipeline is a 27 bar, 18.5km gas pipeline in Middlesex, UK, commissioned by National Grid to meet rising gas demands in West London. This included a 900m long TBM driven tunnel with a precast fibre reinforced segmental lining.

Year: 2009

Client and Location:
National Grid; Southall to Harefield, UK

Type of tunnel:
Gas transfer tunnel

Ground conditions:
London clay (a stiff overconsolidated clay)

Alignment length:
976m; Depth approximately 21m

Thrust of TBM:
Maximum theoretical thrust: 6800kN.
Operating thrust: 2500kN

7.2 Design Approach Adopted

Design method & standard used:

Specified strengths of concrete – compressive and residual tensile:
C45/55; flexural strength=5,0 N/mm^2;
Residual post-crack=2,4 N/mm^2

Inner and outer diameter:
ID 2.59m, OD 2.95m

Ring segmentation:
7 segments +1 key

Dimensions of segments :
Thickness: 0.180m, ring length: 1.0m

Type of segment reinforcement:
macrosynthetic fibres

Fibre type: Length, aspect ratio, tensile strength: -

Quantity of reinforcement per m^3 of concrete:
7kg Barchip fibres

7.3 Project Benefits

- Off-site segment production: segments were produced at a local precast factory where synthetic fibre was mixed into the concrete then poured into vertical moulds. The initial segments were preassembled at the plant to form a trial ring to ensure that the correct tolerances were achieved. The segments were then horizontally stacked and trucked to site.
- The use of fibres in these segments proved very effective in meeting all the design requirements as well as ensuring that the segments sustained minimal damage from the jacking rams during installation. The segments have since performed to the specified design criteria.
- The use of fibres has lowered the overall carbon footprint of the project.
- Concerns over corrosion of the segment reinforcement were removed.

7.4 Picture Reference

Figure 29 : Segmental lining of macrosynthetic fibre reinforced TBM tunnel

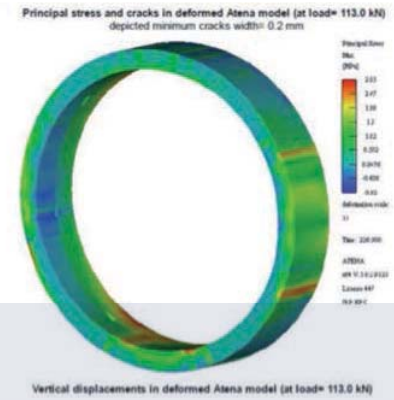

Figure 30 : Finite element analysis designs by JKP Static